Protocol of Radiotherapy for Urinary Bladder Cancer

- **Indication of radiotherapy**
  
  I. Definitive setting/Bladder preservation
     
     (1) Superficial tumor recurrence and/or progression after BCG instillation without extensive Tis
     
     (2) Muscle-invasive disease (≧T2)
     
     (3) Patients refuse radical cystectomy
     
     (4) Patients are not-cystectomy candidates
  
  II. Adjuvant setting after cystectomy:
     
     (1) margin (+) when radical cystectomy is performed
     
     (2) pT3-4, lymph node (+), resection margin (+) or high grade when partial cystectomy is performed
  
  III. Palliative purpose
     
     (1) Unresectable disease
     
     (2) Local palliation in patients with metastatic disease

- **CT simulation**
  
  - Supine position
  - Urinary bladder must be emptied or bladder control (drink tolerable fixed amount of water and wait fixed duration of time)
  - Immobilization
  - Recommend consulting bladder map from TURBT for planning
  - Use of IGRT and/or fiducials for decreasing in PTV expansion is encouraged

- **Treatment planning of radiation therapy**
  
  - Common definition of radiation portal of 4-field technique
    
    - Anterior – posterior fields extend laterally 1.5 cm to the bony pelvis; exclude the inferior corners to protect femoral heads
    
    - Lateral fields extend anteriorly 1.5-2 cm from the most anterior aspect of the bladder. The posterior border extend 2.5 cm posterior to the most posterior aspect of the bladder and falls within the rectum.
    
    - The inferior border: below the middle of the obturator foramen
    
    - The superior border: L5-S1 or at the superior SI joint.
  
  - IMRT technique (If used, strongly consider IGRT)
    
    - GTV: macroscopic tumor visible on CT / MRI / cystoscopy
    
    - CTV: GTV + whole bladder ± lymph nodes (obturator, external and...
internal iliac, perivesical, presacral region) ± proximal urethra ± prostate ± prostate urethra in men
- PTV: CTV + 0.7-2 cm and could be more generous superiorly
  * margin could be adjusted individually
- Boost volumes = entire bladder or partial bladder.
  CTV = GTV + 0.5-0.7cm. PTV = CTV + 1.5 cm.
  * margin could be adjusted individually
- Arc-based treatment is ideal to reduce the length of treatment and minimize changes in bladder volume during treatment delivery

- **The prescription dose**
  - **Dose per fraction**
    - Once daily 1.8-2 Gy
  - **Total dose**
    - 60-66 Gy to bladder tumor (If reassess tumor after 39.6-50.4 Gy and complete response was noted, boost is optional)
    - 39.6-50.4 Gy to whole bladder ± pelvic lymph nodes (boost higher dose to gross lymphadenopathy could be considered)

- **Normal tissue constraint**
  - Rectum
    - V65 < 17%
    - V40 < 35%
  - Small bowel
    - Maximum dose < 52 Gy
    - Volume received greater than 45 Gy < 300 CC
  - Femoral head
    - V50 < 5-10%

- **Delivery**
  - Urinary bladder must be emptied or bladder control
  - Use of IGRT and/or fiducials is encouraged

**Follow-up**
1. Follow-up with urine cytology and cystoscopy every 3 months × 1 year, every 6 months × 2 year, then annually.
2. Imaging of chest, upper tracts, abdomen, and pelvis every 3–6 months for 2 year, then annually.
References:


